

WHAT IS CLAIMED IS:

1. An apparatus for servicing an automobile fluid containing subsystem having a fluid reservoir with a subsystem pump and an inlet port and an outlet port, said apparatus comprising:

5 a manifold defining a first manifold port for coupling to said inlet port, a second manifold port for coupling to said outlet port, a fresh fluid manifold port, a used fluid manifold port, and a fluid transfer circuit therebetween;

a first valve having a valve inlet port in communication with said second manifold port and a valve outlet port in communication with said first manifold port and said used fluid port, said first valve being selectively operable to place said second manifold port in communication with either said first manifold port or said used fluid manifold port;

a fresh fluid source coupled to said fresh fluid manifold port;

15 a common pump interposed between said fluid manifold ports and said first manifold port for pumping a fluid from either of said fluid manifold ports to said first manifold port;

a second valve having a valve outlet port in communication with said common pump and a valve inlet port in communication with said used fluid manifold port and said fresh fluid manifold port, said second valve being selectively operable to place said used fluid manifold port or said fresh fluid manifold port in communication with said first manifold port;

20 whereby, upon coupling said first manifold port to said inlet port and said second manifold port to said outlet port, said subsystem pump may be activated and said common pump may be selectively operated to direct at least one fluid through said fluid transfer circuit as determined by the selective operation of at least one of said valves.

2. The apparatus as set forth in claim 1 wherein:

said first manifold port is a return port;

said second manifold port is an exhaust port; and

5 said fluid transfer circuit includes a drain path for directing fluid entering said return port to said used fluid manifold port, a bypass path for directing fluid entering said return port to said exhaust port, a supply path for directing fluid entering said fresh fluid manifold port to said exhaust port, and a dump path for directing fluid entering said used fluid manifold port to said exhaust port.

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3. The apparatus as set forth in claim 2 wherein:

said manifold is constructed to cause said drain and bypass paths to diverge at a point in said fluid transfer circuit downstream from said return port.

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4. The apparatus as set forth in claim 2 wherein:

said manifold is constructed to cause said supply and dump paths to converge at a point in said fluid transfer circuit upstream of said exhaust port.

5. The apparatus as set forth in claim 3 wherein:

20 said first valve is disposed in said fluid transfer circuit at said point of divergence and is selectively operable between a drain position and a bypass position.

6. The apparatus as set forth in claim 4 wherein:

25 said second valve is disposed in said fluid transfer circuit at said point of convergence and is selectively operable between a supply position and a dump position.

7. The apparatus as set forth in claim 2 wherein:  
said paths are formed of adjacent linear segments within said manifold.

8. The apparatus as set forth in claim 1 wherein:  
5 said manifold includes a suction port downstream of said second valve and a  
pressure port upstream of said first manifold port; and  
said common pump includes a suction side coupled to said suction port via a  
suction hose and a pressure side coupled to said pressure port via a pressure hose.

10 9. The apparatus as set forth in claim 1 further including:  
a used fluid receptacle coupled to said used fluid manifold port.

10. The apparatus as set forth in claim 9 wherein:  
said used fluid receptacle includes a used fluid sensor for providing an indicator  
15 proportional to a used fluid level in said used fluid receptacle; and  
said fresh fluid source includes a new fluid sensor for providing an indicator  
proportional to a fresh fluid level in said fresh fluid source.

11. The apparatus as set forth in claim 10 further including:  
20 a controller coupled to said used fluid sensor for receiving a first signal  
proportional to a level of fluid within said used fluid tank, said processor being  
coupled to said new fluid sensor for receiving a second signal proportional to a level of  
fluid within said fresh fluid source.

12. The apparatus as set forth in claim 11 wherein:  
25 said controller is coupled to said common pump and said valves which are  
selectively operable based on signals received from said used and new fluid sensors.

13. The apparatus as set forth in claim 1 further including:  
a fluid transfer segment leading to said second manifold port and including a  
pressure sensor in communication with said fluid transfer segment for sensing fluid  
5 pressure in said segment.

14. The apparatus as set forth in claim 1 further including:  
a drain side filter connected to said manifold and interposed between said  
second manifold port and said first valve.  
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15. The apparatus as set forth in claim 1 further including:  
a supply side filter connected to said manifold and interposed between said  
pump and said first manifold port.

15 16. The apparatus as set forth in claim 1 further including:  
a first filter connected to said manifold and interposed between said second  
manifold port and said first valve; and  
a second filter connected to said manifold and interposed between said pump  
and said first manifold port.

20 17. The apparatus as set forth in claim 16 wherein:  
said first and second filters are connected to said manifold by first and second  
threaded, hollow, nipples.

25 18. The apparatus as set forth in claim 1 further including;  
a check valve interposed between said pump and said first manifold port for  
preventing a backflow of fluid from entering an outlet of said pump.

19. The apparatus as set forth in claim 1 wherein:  
said common pump is irreversible.

5 20. The apparatus as set forth in claim 1 wherein:  
said common pump incorporates a check valve for maintaining pump in a  
primed condition when in use.

21. The apparatus as set forth in claim 1 wherein:  
10 wherein said first and second valves are 2-position, 3-way solenoid valves.

22. The apparatus as set forth in claim 11 further including:  
a pair of battery cables in electrical communication with said controller, said  
pump, and said valves for connecting to a power source.

15 23. The apparatus as set forth in claim 11 wherein:  
said controller includes a processor and is coupled to a control board for  
receiving operator commands.

20 24. The apparatus as set forth in claim 2 wherein:  
said first valve is selectively operable to cross over the flow of fluid between the  
drain path and the supply path.

25 25. The apparatus as set forth in claim 24 wherein:  
said first valve is a 3-position, 4-way solenoid valve including a fluid exchange  
position, a circulation position, and a cross over flow position.

26. The apparatus as set forth in claim 9 further including:  
wherein said manifold, said used fluid receptacle, said fresh fluid source, and  
said common pump are housed in a wheeled cabinet.

5 27. The apparatus as set forth in claim 23 wherein:  
said control board includes an options menu region listing a plurality of  
servicing options available to an operator, a display region including a counter display  
and a plurality of status and informational indicators, and a control region including a  
plurality of actuator buttons for inputting operator commands to said controller.

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28. The apparatus as set forth in claim 27 wherein:  
said control region includes a start button which is selectively operable to  
transmit a signal to said controller to initiate a fluid exchange mode.

15 29. The apparatus as set forth in claim 27 wherein:  
said control region includes a cycle sensors button which is selectively operable  
to transmit a signal to said controller to actuate said first and second valves back and  
forth between valve positions.

20 30. The apparatus as set forth in claim 27 wherein:  
said control region includes a quantity selection button which is selectively  
operable to illuminate one of a plurality of quantity indicators in said status region and  
transmit a selected quantity signal to said controller.

31. The apparatus as set forth in claim 27 wherein:

said processor is programmed to accumulate a total quantity of fluid measured by at least one of said used or new fluid sensors and display said total quantity in said counter display upon actuation of a button in said control region.

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32. The apparatus as set forth in claim 27 wherein:

said control region includes a drain button which is selectively operable to transmit a signal to said processor to actuate said second valve to a dump position and said common pump to pump fluid from said used fluid receptacle to said second port.

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33. An apparatus as set forth in claim 27 wherein:

said control region includes an options button for selectively scrolling through said options menu listing and displaying a selected option in said display counter, said selected option being initiated upon selection of a start button in said control region.

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34. An apparatus as set forth in claim 27 wherein:

said display region includes an indicator which illuminates to alert an operator of an incorrect hose coupling condition.

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35. An apparatus as set forth in claim 1 wherein:

said common pump is the sole pump in said apparatus.

36. A method of servicing an automobile subsystem including a fluid

reservoir having an upstream component and a downstream component and a

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subsystem pump with a servicing apparatus having a return hose coupled to said downstream component and a supply hose coupled to said upstream component and including an apparatus pump and a processor, said method comprising:

selecting a fluid quantity to be exchanged;  
activating said subsystem pump to pump subsystem fluid into said servicing  
apparatus via said return hose;  
removing an incremental amount of subsystem fluid less than said selected fluid  
5 quantity by opening a drain passage;  
closing said drain passage upon removing said incremental amount of  
subsystem fluid;  
opening a supply passage;  
activating said apparatus pump to pump a second fluid through said supply  
10 passage into said subsystem via said supply hose;  
adding said incremental amount of said second fluid into said fluid reservoir;  
deactivating said apparatus pump upon adding said incremental amount of said  
second fluid into said fluid reservoir; and  
repeating said removing through deactivating steps until a total incremental  
15 amount of fluid added to said subsystem is greater than or equal to said selected fluid  
quantity.

37. The method of claim 36 further including:  
coupling a used fluid tank with a used fluid sensor to said drain passage for  
20 collecting said subsystem fluid; and  
coupling a new fluid supply with a new fluid sensor to said supply passage.

38. The method of claim 37 further including:  
reading said used fluid sensor with said processor to determine said incremental  
25 amount of subsystem fluid.



39. The method of claim 37 further including:

reading said new fluid sensor with said processor to determine said incremental amount of said second fluid.

5 40. The method of claim 37 further including:

reading said used fluid sensor with said processor to determine said incremental amount of subsystem fluid;

reading said new fluid sensor with said processor to determine said incremental amount of said second fluid; and

10 selectively operating said apparatus pump with said processor based on at least one of said reading steps.

41. The method of claim 36 further including:

providing a circulation passage in said service apparatus;

15 circulating one of said subsystem fluid or said second fluid between said servicing apparatus and said subsystem reservoir through said circulation passage and said return and supply hoses.

42. The method of claim 36 further including:

20 providing a selectively operable valving component coupled to said processor for opening and closing said drain passage and opening said supply passage.

43. The method of claim 36 further including:

coupling a used fluid tank to a drain port of said drain passage;

25 collecting said incremental amounts of subsystem fluid in said used fluid tank to store a collected fluid;

uncoupling said supply hose from said upstream component;

opening a dump passage in communication with said drain port; and  
actuating said apparatus pump to pump said collected fluid from said used fluid tank through said dump passage and expelling said collected fluid out said supply hose.

5           44.    A fluid exchanging apparatus for servicing automobile subsystems having a fluid reservoir including a subsystem pump and an effluent port and an influent port, said apparatus comprising:

10               a fluid circuit including a drain path for directing fluid entering a return port to a used fluid port, a bypass path for directing fluid entering said return port to an exhaust port, a supply path for directing fluid entering a fresh fluid supply port to said exhaust port, and a dump path for directing fluid entering said used fluid port to said exhaust port;

15               a rigid manifold body housing at least a portion of said fluid circuit and including a suction port and a pressure port common to said dump and supply paths;  
                a divergence of said drain and bypass paths downstream from said return port;  
                a convergence of said supply and dump paths upstream of said used fluid port and said supply port;

20               a first solenoid valve interposed in said divergence of said drain and bypass paths and selectively operable between at least a drain position and a bypass position;  
                a second solenoid valve interposed in said convergence of said supply and dump paths and selectively operable between at least a supply position and a dump position;

                a common pump coupled to said suction port and said pressure port and interposed in said fluid circuit between said convergence and said exhaust port for directing fluid entering one of said used fluid or supply ports to said exhaust port;

25               a used fluid collection tank including a used fluid sensor and including a used fluid conduit for connecting to said drain port;

a new fluid supply including a new fluid sensor and a fresh fluid conduit for connected to said supply port;

a control board for receiving operator commands; and

a processor coupled to said control board, said used and new fluid sensors, said  
5 pump and said solenoids whereby, upon connecting said return port to said effluent  
port and said exhaust port to said influent port and actuating said subsystem pump, and  
further upon receipt of an operator command from said control board, said processor  
may selectively operate said common pump and selectively position said solenoids  
based on readings of said used and new fluid sensors and said operator command to  
10 direct fluid through said fluid circuit and between said apparatus and said subsystem.

45. An apparatus for servicing automobile subsystems having a fluid reservoir with an effluent port and an influent port, said apparatus comprising:

a fluid circuit including a drain path connecting a return port to a used fluid  
15 port, a bypass path connecting said return port to an exhaust port, a supply path  
connecting a fresh fluid supply port to said exhaust port, and a dump path connecting  
said used fluid port to said exhaust port, said drain and bypass paths having a first  
common section terminating in a divergence downstream from said return port, and  
said supply and dump paths forming a convergence to a second common section  
20 upstream of said exhaust port;

a flow diverter means including a first component in said divergence for diverting flow between said drain and bypass paths and a second component in said convergence for diverting flow between said supply and dump paths; and

pumping means interposed upstream of said convergence for pumping fluid  
25 from one of said drain or supply ports to said exhaust port.

46. The apparatus set forth in claim 45 further including;  
a tank collection means for collecting a first fluid expelled through said drain  
port; and  
a supply means for storing a second fluid to be withdrawn through said supply  
5 port by said pumping means.

47. The apparatus as set forth in claim 45 further including;  
controlling means including a processor coupled to said pumping means and  
said flow diverter means for selectively operating said pumping means and said flow  
10 diverter means to direct fluid through said fluid circuit.

48. An apparatus for exchanging fluid with a vehicle component having a  
reservoir with an inlet and an outlet, said apparatus comprising:  
a fluid circuit defining a supply path and a dump path having a common fluid  
15 delivery section, said supply path connecting a supply manifold port to an exhaust port  
and including fresh fluid delivery section, said dump path connecting a used fluid  
manifold port to said exhaust port and including a used fluid delivery section, said  
common fluid delivery section being formed between a convergence of said fresh and  
used fluid delivery sections and said exhaust port and including a suction port and a  
20 pressure port;  
a pump coupled to said suction and pressure ports;  
a valving component interposed in said convergence and selectively operable to  
open a passage between either of said fresh and used fluid delivery sections and said  
common section.

49. The apparatus as set forth in claim 48 further including:  
a used fluid tank coupled to said used fluid manifold port; and  
a fresh fluid supply coupled to said supply manifold port.

5 50. The apparatus as set forth in claim 1 further including:  
an auxiliary valve interposed between said manifold and said subsystem, said  
auxiliary valve including a housing with a central bore and an auxiliary return port for  
coupling to said inlet port or said outlet port of said subsystem, an auxiliary exhaust  
port for coupling to the other of said inlet port or outlet port of said subsystem, a first  
10 passthrough port coupled to said second manifold port, and a second passthrough port  
coupled to said first manifold port; and  
a valve body slidably received in said bore and, when in use, selectively  
positionable between a first position placing said auxiliary return port in fluid  
communication with said second manifold port and said auxiliary exhaust port in fluid  
15 communication with said first manifold port and a second position placing said  
auxiliary return port in fluid communication with said first manifold port and said  
auxiliary exhaust port in fluid communication with said first manifold port.